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ABSTRACT

The doctoral thesis summarized in this document investigated which set of teacher education program admissions criteria best predict achievement by examining the relationship between outcomes in the teacher education program and test scores and other indicators of academic achievement. The paraticular problem was to determine the predictive value of currently utilized admission tests of academic achievement for teacher education programs at the College of Education, University of Akron (Ohio). A sample of students (N=455) who had been admitted to the College of Education during calendar year 1990 was compared to the population in terms of standardized test scores, incoming grade point averages, course grades, major department, and demographics. The six predictor variables selected by regression analysis were: incoming cumulative grade point average, ACT English, whether a course in educational media had been taken, grades in two edcation course prerequisites, and whether the ACT had been taken. Data analysis indicated that the best predictor of future performance is past performance, and that standardized tests are preferable to course grades due to outside factors (e.g., grade inflation). In addition, performance in certain specific education courses proved to be predictive of academic achievement. These findings imply the desirability of colleges of education requiring certain prerequisite courses and using those course grades in program admissions decisions. (LL)

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American Association of University Administrators Foundation

RELATIONSHIP BETWEEN ACADEMIC ACHIEVEMENT AND PREADMISSION TESTING CRITERIA FOR TEACHER EDUCATION STUDENTS AT THE UNIVERSITY OF AKRON

by

Sandra C. Coyner

1993 Winner of the AAUA Foundation

Donald A. Gatzke Award

for Excellence in Research

on the Administration of Higher Education

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September, 1993

Dear Colleagues:

The American Association of University Administrators Foundation was established to encourage research leading to an improvement in the quality of the administration of higher education. The Foundation has also sought to provide a mechanism to share successful practices and patterns of administration in higher education with colleges and universities throughout the United States and internationally.

The Foundation's Board of Directors sponsored a program to encourage wider dissemination of the research being done by doctoral students in programs of higher education administration and in other divisions of colleges and universities focusing on problems in the administration of higher education. In 1994, the Foundation will once again recognize the most outstanding contributions in general collegiate level administration by doctoral students completing their work and awarded a degree during the academic year 1992-1993.

The recipient of the Foundations's Donald A. Gatzke Award is announced officially each year at the National Assembly of the American Association of University Administrators. The Board of Directors of the Foundation serves as the panel of judges and reviews entries submitted by many of the country's finest programs in higher education administration.

For 1993, the judges chose Dr. Sandra Coyner, whose thesis was nominated by Dr. Rita Saslaw of the University of Akron and was entitled "Relationship Between Academic Achievement and Preadmission Testing Criteria for Teacher Education Studies at The University of Akron." This thesis examined the predictive value of currently utilized admission tests of academic achievement for teacher education programs. The relationship among teacher education program admission tests and other indicators of academic achievement was also investigated to determine which set of teacher education program admissions criteria best predict academic achievement.

Data from this study indicate that the best predictor of future performance is past performance. Standardized tests were, in general, preferable to course grades for prediction due to outside factors (such as grade inflation) that can influence grades. However, performance in certain specific education courses proved to be predictive of academic achievement. It points to the desirability of colleges of education requiring certain prerequisite courses and using those course grades for program admissions decisions.

We hope that this abstract will be of interest to those wrestling with the perplexing problems of higher education administration, and that it will encourage other doctoral students to pursue dissertation research which focuses on the major issues facing administrators in higher education.

H. J. Zoffer
President
AAUA Foundation

RELATIONSHIP BETWEEN ACADEMIC ACHIEVEMENT AND PREADMISSION TESTING CRITERIA FOR TEACHER EDUCATION STUDENTS AT THE UNIVERSITY OF AKRON

Sandra C. Coyner

Abstract

The issue of teacher education program admissions testing is multifaceted and complex. This study provided research, findings, and results regarding academic admissions criteria utilized by teacher education administrators in their decision-making process for program admission. Specifically, the relationship between outcomes in the teacher education program and test scores was investigated.

Overview

The movement for teacher testing grew with the current educational reform movement, responding to a perceived, growing lack of public support and confidence in teachers and teaching (Rudner, 1987). Testing was viewed as a way to improve the quality of teachers and, therefore, the quality of education by screening out unqualified individuals, strengthening the teaching profession and attracting better qualified candidates (Rudner, 1987; Sandefur, 1986). Specifically, teacher education program admission testing became an avenue for assessing a certain level of competence and achievement for prospective teacher education students.

Admissions testing for entrance into a teacher education program involves the use of standardized test results primarily for the purpose of keeping unqualified individuals out of the teaching profession (Rudner, 1987). Teacher education admission tests, as defined by Rudner (1987), are tests given prior to admittance into a teacher preparation program. The tests usually assess the student's basic reading, writing, and arithmetic skills. Although the tests used do not directly test teaching ability they were believed to test skills and knowledge that are prerequisites to it (Rudner, 1987).

While teacher education program admissions testing may be a way to screen applicants, there is some concern with regard to negative impacts. Opponents of testing as a criterion for admission voiced concerns citing policy restriction on admissions which may contribute to a teacher shortage and that a disproportionate number of minority candidates may not gain entry into the teaching field due to low pass rates on those tests used for admission decisions (Sandefur, 1986). Concerns were raised that testing alone may not improve future teacher quality. The problem of teacher quality may not be as severe as the media suggests and testing may be an overreaction to a non-existent problem (Pugach & Raths, 1983). Additionally, it was noted that the tests are inappropriate due to not being representative of what a teacher actually should know and be able to do (Darling-Hammond, 1986), and finally that tests provide an insufficient standard (Rudner, 1987).

Many higher education institutions have increased academic admissions criteria for teacher education programs. These criteria, established over the past 13

years, vary considerably in terms of quality; consequently, the importance of admissions testing became an important consideration (Rudner, 1987). While the need arose to legitimize teacher education programs, care must be taken to avoid admissions testing that is non-relevant or redundant. Analysis of academic achievement revealed whether current teacher education program admissions criteria are, in fact, predictive, or merely perpetuating an overtesting of prospective teacher education candidates.

Therefore, the challenge of teacher education program admissions testing is to administer tests that are appropriate for prospective teacher candidates and reveal relevant information for administrative decision-making while not unfairly restricting program entry. Consequently, the problem investigated was to determine the predictive value of currently utilized admissions tests to academic achievement for teacher education programs for the College of Education at The University of Akron. Further, the relationship among teacher education program admissions test and other indicators of academic achievement was investigated to determine which set of teacher education program admissions criteria best predict academic achievement.

Design

A predictive validity study was designed to determine the degree to which admissions test scores and course grades predict the academic achievement of teacher education students in the College of Education. The sample selected was 455 students (359 female, 96 male) who were admitted to the College of Education during the calendar year 1990. Systematic sampling was utilized to select students into the sample. The sample was compared to the population in terms of ACT and PPST scores, incoming GPA, course grades, major department, and demographics, and it was determined that the sample was representative in terms of age, race, sex, and department major. Incoming cumulative GPA (BGPA) was computed for each student using the formula: GPA = cumulative quality points ÷ hours completed.[1] The first semester GPA (EGPA) was computed using the same formula and included only grades of coursework taken after the official College of Education admission.

The all possible subsets regression maximum R was utilized to identify the best set of predictors of academic achievement. A cross validation was performed to confirm the predictive power of the equation chosen and assess its correctness for administrative decision-making purposes.

Analysis

The Statistical Analysis System (SAS; 1985) was used to compute the results. Means, standard deviations, and correlations of all variables were calculated. Preliminary analyses were conducted to explore the potential impact of missing data and of other variables (department affiliation and demographic characteristics) on the

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[1]Quality points were determined as follows: A = 4.0, A- = 3.75, B+ = 3.50, B = 3.00, B- = 2.75, C+ = 2.50, C = 2.00, C- = 1.75, D+ = 1.50, D = 1.00, D- = .75, F = 0.

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outcome of the study. Multiple regression techniques and multiple correlations were utilized to determine which combination of variables best predicted first semester GPA.

Specifically, the all possible subsets regression maximum R (Hocking, 1976) was chosen to identify the best set of predictors of academic achievement. Crocker and Algina (1986) noted that the all possible subsets regression involves calculating the predictive accuracy for every possible combination of predictors, resulting in the ability to choose the best set of predictors. Additionally, in attempting to find a subset, collecting data on predictors that contribute little or nothing to predictive accuracy can be avoided (Hocking, 1976).

The quality of the analysis was assessed in two ways (Crocker & Algina, 1986). First, an indication of the accuracy of the predictive equation was demonstrated by the selection of a second sample (n=30) to act as a cross validation sample. The predicted scores were compared to the actual scores. Differences between them were calculated, converted to absolute values, and averaged to generate the mean error. These mean errors were calculated for each model and compared to identify the model with the smallest, or least, mean error. Second, to determine the accuracy of decisions based on the predictive equation, a cross tabulation was performed to identify the number of times the predictive equation produced a correct decision (Pedhazur, 1982). The importance of administrative decision making in teacher education program admissions warranted an examination of the equation's predictive power.

Findings

Study results are reported in three sections. The first section includes a description of the demographic characteristics of the sample and indicators of academic achievement. Demographics indicated that of the 455 students in the sample, 29 (6.4%) were non-white. Four departments were represented: Elementary Education (5200) - 288 students, Secondary Education (5300) - 106 students, Physical and Health Education (5550) - 35 students, and Counseling and Special Education (5610) - 26 students. Table 1 presents means and standard deviations for all variables.

The second section reports the results of the regression analyses conducted to identify which of a set of test scores and grades best predict first semester GPA in the College of Education. The preliminary analyses necessary to this study were performed in four ways. First, correlations among predictor variables were calculated. Results indicated that academic achievement as measured by EGPA correlated with PPST ($r = .22$-$.27$, $p < .0001$) and ACT ($r = .29$-$.35$) components, and the intercorrelations among PPST and ACT tests indicate that all components of the PPST correlate significantly with all components of the ACT. These results are not surprising and suggest that both tests reflect something similar and there is shared variance.

Table 1

Number of Subjects, Mean, Standard Deviation for Each Study Variable

Variable	N	Mean	Standard Deviation
Admission Test Scores			
PPST - Reading	355	176.9	5.65
PPST - Math	355	176.0	7.67
PPST - Writing	355	174.6	3.84
ACT - English	234	18.3	4.44
ACT - Math	234	15.7	6.85
ACT - Composite	234	17.9	4.83
Grade Point Average			
Incoming Cumulative GPA	455	2.93	0.46
Academic Course Grades			
Introduction to Public Speaking (1100:105)	109	3.1	0.72
Effective Oral Communication (1100:106)	256	3.2	0.59
English Composition I (1100:111)	403	3.1	0.68
English Composition II (1100:112)	407	3.1	0.71
Introduction to Professional Education (5100:150)	365	3.1	0.64
Human Development and Learning (5100:250)	305	3.0	0.72
Educational Media and Technology (5100:310)	130	3.4	0.52
Educational Measurement and Evaluation (5100:350)	53	3.0	1.0
Criterion Variable			
Academic Achievement - First Semester GPA (EGPA)	455	3.21	0.59

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Second, the correlations of each predictor variable with the criterion were compared. Results indicated that all selected preadmission course grades appear to correlate significantly with academic achievement after admission to the College of Education, and incoming cumulative GPA (BGPA) accounts for 22% of the variation in academic achievement and has the greatest coefficient of correlation ($r = .47$) among all the variables considered in this study. T-tests were performed to compare the academic achievement of students who took various courses compared with the academic achievement measured by course grades of those who have not taken various courses.

Third, the treatment of missing data was determined and explained. In this study, data gathered were not missing in the true statistical sense of being not reported or not obtainable but were in effect non-existent data, e.g., students did not take the ACT test, therefore no data were available to be reported. Missing data in this study were handled for each variable by being replaced with the mean of the variable (Cohen & Cohen, 1983), noting any change in the correlations greater than .05. Results suggested that missing data did not adversely impact the study. Additionally, dummy coding ("1" for missing, "0" for present) was performed, allowing the presence or absence of missing data to be treated as additional information much like additional variables (Cohen & Cohen, 1983), allowing analyses of the relative importance of the presence of certain data (not just its numerical value). This treatment resulting in standardizing grades for the two speech courses, utilizing the grade of one English course to represent the English grade, missing data within a variable was replaced with its mean, and vectors were added to represent missing/ not missing data. Fourth, an examination for differences by department and gender was performed. Results indicated that all departments are fairly consistent in incoming cumulative GPA and first semester GPA and that no one department is consistently having higher ranking than the others in all variables reported.

The regression analyses also yielded a set of prediction equations that could be used to predict first semester GPA for future cohorts of students. R-squared was compared in the different equations to determine at which point the difference in R-squared was not significant. Table 2 shows that after six variables are introduced into the equation, there was only a .4% increase in R-squared. An F-test of significance indicates that the seventh increment was not significant at the .05 level (F=.75, 1, 448), suggesting that the subsequent addition of variables failed to enhance or even decrease predictive power. Therefore, the model with six variables was selected as the best model for this study. The six predictor variables selected by the regression analysis are incoming cumulative GPA (BGPA), ACT English (ACTE), whether course 5100:310 was taken (BINARYC310), grade in course 5100:350, grade in course 5100:150, and whether the ACT was taken (BINARYACT). The prediction model is as follows:

$$EGPA = .245 + .475(BGPA) + .026(ACTE) + .160(BINARYC310) + .202(5100:350) + .102(5100:150) + .094(BINARYACT)$$

where

EGPA = first semester GPA after College of Education admission (0.0-4.0)

BGPA = incoming cumulative GPA prior to College of Education admission (0.0-4.0)

ACTE = ACT English score (1-33)

BINARYC310 = whether or not 5100:310 was taken by the student (1 = missing, 0 = present)

5100:350 = course grade in Measurement and Evaluation course (0.0-4.0)

5100:150 = course grade in Introduction to Professional Education course (0.0-4.0)

BINARYACT = whether or not ACT was taken by the student (1 = missing, 0 = present)

Table 2

Analysis of Variance for Six-Variable Model for Predicting EGPA

Source	DF	Sum of Squares	Mean Square	F Value	Prob > F
Model	6	44.25582	7.37597	29.664	0.0001
Error	448	111.39703	0.24865		
C Total	454	155.65285			
Root MSE		0.49865	R-square	0.2843	
Dep. Mean		3.21374	Adj R-sq	0.2747	
C.V.		15.51628			

The standardized regression coefficients for the six variables were compared in relation to relative importance. Because there is a recognized correlation among these variables, the standardized coefficients might be depressed. Incoming cumulative GPA (BGPA) was the most important variable among the predictors (β = .375).

Lastly, due to the possibility of data dependence and the instability of the type of regression analysis previously conducted, it was necessary to address the question of generalizability. Therefore, the third section reports the results of two studies of a cross validation sample performed to confirm the six variable model selection and determine its significance in decision-making. One study was intended to confirm the generalizability of the prediction equation obtained from the regression analysis

by using the prediction equation to estimate a student's first semester GPA and then comparing it to the obtained first semester GPA; the second was intended to confirm whether the prediction equation successfully identified students who would be successes or failures at the College of Education, based on attainment of a minimum GPA.

The cross validation sample of 30 students was randomly selected using 1991 College of Education admits. Handling of data was done in the same manner as for the original sample. The results for the cross validation test for all 23 models showed the model with six variables with the least mean error. This agrees with the previous analysis of the original sample that indicated the six variable model as the best selection for prediction, further supporting the selection of the six variable model for this study. Additionally, results indicated that the difference between the R-squared of the original sample and the R-squared of the cross validation sample is small, suggesting that the model may be applied to future predictions (Pedhazur, 1982).

A cross tabulation was performed on the cross validation sample to determine the extent to which the model selected would offer a higher education administrator the information necessary for making correct decisions. Correct decisions were considered to be decisions that allow qualified students (determined by the selected model) admittance to the College of Education while denying students who would not be successful in the teacher education program. The cross tabulation compared the number of correct decisions (based on minimum GPA) against observed data. The results indicated how often an administrator would be making correct decision; i.e. admitting qualified students and rejecting those having little chance for success. The results are presented in Table 3. This demonstrated that an administrator using the six variable model would make correct decisions 27 out of 30 times. The three incorrect decisions would occur by admitting students who would not be successful in the teacher education program. However, no students would could meet the standards would be incorrectly denied admission. Since this model would be used for admission purposes, it appears that there is no chance of rejecting students who would be successful in the teacher education program. Administrators can feel confident that the model will offer a tool for decision-making and not adversely affect teacher education applicants.

Table 3

Cross Tabulation Results

		Observed Results	
		< 2.5	≥ 2.5
Predicted Results	< 2.5	1	0
	≥ 2.5	3	26

Conclusions

Data from this study indicate that the best predictor of future performance is past performance. It also confirms past research that reported ACT and PPST yielded similar information and could be considered redundant if both are required for admission to a teacher education program. (Siebert, 1989; Fletcher, Gwilt, & Smith, 1989; Aksamit, Mitchell, & Pozehl, 1987). Standardized tests were, in general, preferable to course grades for prediction due to outside factors (e.g., grade inflation) that can influence grades; however, performance in certain education courses proved to be predictive of academic achievement.

The model selected for prediction demonstrated that ACT English, 5200:350 (Measurement and Testing course), 5200:150 (Introduction to Professional Education), whether or not course 5100:310 (Educational Media) was taken, or whether or not the ACT was taken all appear to predict academic achievement. It is also noteworthy that missing data appeared to be meaningful to the study and to the prediction equation. The PPST was found to have no predictive value in this study, however this is probably due to its correlation with ACT.

The strength of the study lies not only in the model selected, but also in the results obtained from the cross validation. The cross validation strongly demonstrated that the model selected does indeed predict future success, but more importantly offers administrators a decision-making tool that insures correct program admissions decisions are made--any error made would be in favor of the student, not denying any qualifying applicant admission to the teacher education program.

Implications and Recommendations

The strength of the model selected as well as its ability to offer administrators confidence in decision-making makes consideration of this model imperative. The model can serve as a basis by which decisions can be made to determine student admission or denial to a teacher education program. The ACT presents some policy implications for teacher education program admission since it emerged as a predictor. Additionally, whether or not students opt to take the ACT had some importance. The PPST, however, appeared to have no additional predictive value when considered in combination with ACT. Since resources are limited in many higher education institutions, existing ACT scores could be used for program admission rather than making students take the PPST, thereby cutting costs.

The results of this study offer information that can influence administrative policy and, in addition, offer information for those doing research and implication studies. The study suggests the importance of achievement measured by grades in particular courses preparatory to entering a teacher education program. It points to the desirability of colleges of education requiring prerequisite courses and using those course grades for program admission decisions. Administrators may want to examine required coursework and make admission criteria adjustments as necessary.

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Finally, this study was important because there was no truncation, which is unusual for studies of this kind. Virtually every student who applied to the College of Education teacher education program in 1990 was admitted to the program and included in the study. This type of non-selection is not common in educational research (Crocker & Algina, 1986), and, therefore, adds to the importance of the results.

Further research is needed to determine additional relationships, teacher education admissions requirements among other higher education institutions and other variables beyond the scope of this study. As teacher education programs become more competitive and post-program testing (NTE) becomes mandatory, it will be imperative for higher education institutions with teacher education programs to carefully and correctly screen applicants for admission. Additional research may provide useful information for teacher education admissions decisions.

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